56-2-50/51

AUTHORS: Vereshchagin, L. F., Yuzefovich, N. A.

TITLE: The Measurement of Sound Velocity in Liquids at a Pressure of up to 2500 Atm. by Means of the Optical Method (Izmereniye skorosti zvuka v zhidkostyakh pod davleniyem do 2500 atm opticheskim metodom)

PERIODICAL: Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 1958, Vol. 34, Nr 2, pp. 534 - 536 (USSR)

ABSTRACT: First the authors shortly refer to previous works dealing with the same subject. The optical lay-out of the apparatus used by the authors is shown in a diagram. As light source served a lamp of the СВДШ type. The ultrasonic oscillations were excited by a piezo-quartz plate which was connected to the oscillation circuit of the high-frequency generator. The range of the operational frequencies covers from 3 - 4 megacycles. The ultrasonic oscillations penetrated through the vessel into the liquid to be investigated. In order to let light pass through the liquid to be investigated two glass-

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56-2-30/51

The Measurement of Sound Velocity in Liquids at a Pressure of up to 2500 Atm. by Means of the Optical Method

-windows were mounted on the vessel. The experiments were carried out at temperatures from 19 to 20°C. The dependence of the sound velocity c on the pressure p for the three liquids investigated is shown in a diagram. These curves are slightly concave to the pressure axis. With carbon tetrachloride the sound velocity could not be measured at pressures above 1200 atm. excess pressure. There are 2 figures, and 5 references, 2 of which are Slavic.

ASSOCIATION: Laboratory for the Physics of Extremely High Pressures AS USSR (Laboratoriya fiziki sverkhvysokikh davleniy Akademii nauk SSSR)

SUBMITTED: November 11, 1957

AVAILABLE: Library of Congress

1. Pressurized liquids-Sound velocity-Measurement processes

Card 2/2

SOV/120-59-1-29/50

AUTHORS: Semerchan, A.A., Vereshchagin, L.F., Isaykov, V.K., Firsov, A.I.

TITLE: A Hydraulic Installation for the Production of a Jet of Liquid Moving with Ultrasonic Speed (Gidravlicheskaya ustanovka dlya polucheniya struy zhidkosti sverkhzvukovoy skorosti)

PERIODICAL: Pribory i tekhnika eksperimenta, 1959, Nr 1, pp 121-125 and 1 plate (USSR)

ABSTRACT: Figs 1 and 2 show a photograph and the general arrangement of the hydraulic installation. The hydraulic compressor is brought into motion by the MAShR-85/6-0 electrical motor (240 kW, 1000 rpm). From the compressor the liquid passes on to a "receiver" with a nozzle through which the liquid is ejected into the atmosphere. The pressure behind the nozzle is 2000-25 000 atm and the speed of the liquid jet is 600-650 m/sec. To achieve this a special high pressure hydrocompressor has been built and is shown diagrammatically in Fig 4. The size of the hydrocompressor is 1100 x 680 x 500 mm^3, the working pressure is 2000 atm, consumption 1500-2500 ℓ/hour, number of cylinders = 1, number of excursions of the piston 1000 per minute, diameter of the piston 22, 27 and 33 mm and the distance through which the piston moves is 70 mm. The high pressure hydrocompressor consists of two main parts, namely, a crankgear and a high pressure cylinder (Fig 5). The

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APPROVED FOR RELEASE: 09/01/2001 CIA-RDP86-00513R001859430002-9"

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A Hydraulic Installation for the Production of a Jet of Liquid Moving with Ultrasonic Speed

high pressure cylinder consists of a thick walled container 5 in which the liquid is compressed. It also includes a pressure valve 4 (shown in greater detail in Fig 6) and inlet valves 3, 6 . 7 is the compressing piston. The form of the nozzle is shown in Fig 8. The system has been used with glycerine (Fig 10) and water (Fig 11). There are 10 figures and 3 Soviet references.

ASSOCIATION: Laboratoriya fiziki sverkhvysokikh davleniy AN SSSR (Laboratory for Physics of Ultrahigh Pressures, Academy of Sciences, USSR)

SUBMITTED: February 1, 1958.

Card 2/2

SOV/179-59-1-19/36

AUTHORS: Beresnev, B. I., Vereshchagin, L. F., Ryabinin, Yu. N. (Moscow)

TITLE: The Extrusion of Metals by a Liquid Under High Pressure (O vydavlivanii metallov zhidkost'yu, nakhodyashcheysya pod vysokim davleniyem)

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Mekhanika i mashinostroyeniye, 1959, Nr 1, pp 128-131 (USSR)

ABSTRACT: The paper is a continuation of earlier work (Ref.2). Extrusion of a metal by a liquid under high pressure is an improvement over extrusion by a plunger, since much of the friction at the walls of the container is eliminated. Experiments were carried out on aluminium AD-I, copper M-2, duralumin D-1M and alloy AMG. The degree of deformation was measured as

$$\phi = (D^2 - d_o^2) 1 D^2 ,$$

or as

$$\delta_f = \ln(D^2/d_o^2) ,$$

where D is the initial diameter of the metal cylinder, and d_o is the diameter of the extruded metal. Curves are given

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SOV/179-59-1-19/36

The Extrusion of Metals by a Liquid under High Pressure

for ϕ and S_f as functions of pressure and the effect of the angle of the cone which reduces the diameter from D to d is also investigated. Microhardness measurements on copper extruded by the plunger method and by the liquid pressure method show that the copper produced by the latter method is the more uniform. There are 4 figures, 1 table and 8 Soviet references.

SUBMITTED: April 14, 1958.

Card 2/2

RYABININ, Yu.N.; LIVSHITS, L.D.; VERESHCHAGIN, L.F.

Plasticity of some alloys at high pressures. Fiz. tver. tela 1 no.3:476-481 Mr '59. (MIRA 12:5)
(Alloys--Testing)

SOV/126-7-1-18/28

AUTHORS: Beresnev, B.I., Vereshchagin, L.F. and Ryabinin, Yu.N.

TITLE: The Influence of Hydrostatic Pressure on the Change in Mechanical Properties of Aluminium After Strong Plastic Deformation (O vliyanii gidrostaticheskogo davleniya na izmeneniye mekhanicheskikh svoystv alyuminiya posle bol'shikh plasticheskikh deformatsiy)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1959, Vol 7, Nr 1, pp 128-132 (USSR)

ABSTRACT: During plastic deformation a change of the fine structure of metals occurs and new micro-defects of the crystal lattice, as well as those already present, develop. Such development of micro-defects in a definite stage of deformation leads to the formation and propagation of macro-fractures. Under conditions of hydrostatic pressure the formation and development of micro-defects during plastic deformation is not only rendered more difficult, but an intensive self-healing process of the existing defects in the crystal lattice takes place (Ref.1), and these effects have an important bearing on the plastic flow. It has been shown that the plasticity of

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The Influence of Hydrostatic Pressure on the Change in Mechanical Properties of Aluminium After Strong Plastic Deformation

materials increases sharply if they are deformed at high hydrostatic pressures. The authors have carried out a study of the extrusion of a number of non-ferrous metals and alloys by liquid under high pressure. The method of such an extrusion process, the rheological effect accompanying the flow of metal through the die and the nature of the change in mechanical properties of the metal extruded by liquid has been described by Beresnev (Refs.9,10). However, it was also necessary to find a means of deforming metal parts to the same extent using various pressures. Extrusion of step-shaped specimens made it possible to solve this problem. The essence of this method is shown in Fig.1. The three specimens have different diameters. The diameter determines the pressure at which metal flows through the dye. Thus it is possible to obtain data of the influence of three different pressures on work-hardening by bringing about three different degrees of deformation. The mechanical properties of aluminium (ADI) as annealed are shown in Table on p 130.

Card 2/4 From the curves of Fig.2 it is possible to calculate the

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The Influence of Hydrostatic Pressure on the Change in Mechanical Properties of Aluminium After Strong Plastic Deformation

usual properties, UTS, yield stress, relative elongation, final reduction in area and the coefficient of uniform reduction in area. In Figs.3, 4 and 5 the relationships between three characteristics of plasticity (final reduction in area, relative elongation and coefficient of uniform reduction in area) and extrusion pressure are shown. It was found that all these characteristics which determine the plasticity of aluminium increase with increase of pressure. As regards the influence of pressure on the strength of the metal, a few conclusions can be arrived at from consideration of Fig.5. It is known that the physical strengthening of a metal is greatest on attaining a deformation which is equal to the coefficient of uniform reduction in area (see Ref.11). As can be seen from Fig.5, pressure causes this coefficient to increase. Hence an increase in strength of aluminium with increase in extrusion pressure at the same preliminary deformation can be expected.

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The Influence of Hydrostatic Pressure on the Change in Mechanical Properties of Aluminium After Strong Plastic Deformation

There are 5 figures, 1 table and 11 references, of which 9 are Soviet and 2 German.

ASSOCIATION: Laboratoriya fiziki sverkhvysokikh davleniy AN SSSR (Laboratory of the Physics of Extremely High Pressures, Ac. Sc. USSR)

SUBMITTED: February 14, 1958

Card 4/4

SOV/126-7-2-13/39

25(1), 18(6), 18(7)

AUTHORS: Beresnev, B. I., Vereshchagin, L. F. and Ryabinin, Yu.N.

TITLE: Change in the Mechanical Properties of Non-Ferrous Metals and Alloys in the Process of Extrusion by a High Pressure Liquid (Izmeneniye mekhanicheskikh svoystv tsvetnykh metallov i splavov pri vydavlivanii ikh zhidkost'yu vysokogo davleniya)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1959, Vol 7, Nr 2, pp 247-253 (USSR)

ABSTRACT: Metal was used for the investigation which had undergone various degrees of deformation by liquid-extrusion as well as by plunger extrusion. The method used for the extrusion of metals by liquid has been described by Beresnev et al. (Ref 5). In order to compare results, an instrument for extruding metals by a plunger was made. Specimens in the form of rods of definite length were made for tensile testing from the metal thus treated. Prior to testing the specimens were gripped in tong-like grips. The distance between the grips was kept at 10 d_o (d_o being the diameter of the specimen prior to testing and being 2-4 mm). Testing was carried out in a specially designed tensile testing machine at 4 mm/min. The force

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Change in the Mechanical Properties of Non-Ferrous Metals and Alloys in the Process of Extrusion by a High Pressure Liquid

applied to the specimen was registered at various stages of testing with an accuracy of up to 0.7 kg. The elongation of the specimen was registered by pointers with an accuracy of up to 0.01 mm. The diameter of the specimen before and after fracture was measured by a micrometer with an accuracy of up to 0.005 mm. The elongation tests enabled the change in mechanical properties (σ_B - yield strength, $\sigma_T^{0.2}$ - yield point, ψ_k - reduction in area) on cold deformation to be established for specimens having undergone various degrees of preliminary deformation for the two methods of extrusion. Considerable attention was paid to the change in microstructure of extruded articles. Microsections were made of specimens which had been deformed to various degrees by the two extrusion methods, and microhardness tests were carried out in a ПМТ-3 machine (Ref 7). In order to avoid work hardening, the sections were electrolytically polished by a method suggested by Popilov et al. (Ref 6). The following metals were

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Change in the Mechanical Properties of Non-Ferrous Metals and Alloys in the Process of Extrusion by a High Pressure Liquid

studied:- aluminium AD1 (0.25% Fe, 0.29% Si), copper M2 (99.76% Cu) and the alloy AMG (3.89% Mg, 0.36% Fe, 0.52% Si). The materials were annealed prior to deformation. The properties of the metals in their original condition are shown in a Table (p 248). The graphs of Figs 1, 2 and 3 show changes in mechanical properties of AD1, M2 and AMG specimens having undergone a preliminary deformation by high pressure liquid extrusion. In Fig 1 the change in σ_B for AD1, M2 and AMG with increase in the extent of preliminary deformation ϕ_{np} is shown. In Fig 2 the change in $\sigma_T^{0.2}$ for the above three alloys with increase in the extent of ϕ_{np} is shown. In Fig 3 the change of coefficient of reduction of area ϕ_k for the above alloys with increase in degree of ϕ_{np} is shown. Fig 4 is a photomicrograph of copper, deformed by liquid-extrusion under high pressure:- a - annealed Cu; b - ϕ_{np} = 0.5;

Card 3/5 B - ϕ_{np} = 0.712. In Fig 5 the distribution of micro-

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Change in the Mechanical Properties of Non-Ferrous Metals and Alloys in the Process of Extrusion by a High Pressure Liquid

hardness H_μ along the cross sections of Cu rods, liquid-extruded at various degrees of preliminary deformation through a die with an entry angle of 22° 30', is shown. (D - rod diameter, d - diameter of the cross section). 1 - annealed metal; 2 - liquid extrusion $\phi_{np}=0.5$; 3 - liquid extrusion $\phi_{np} = 0.624$; 4 - liquid extrusion $\phi_{np} = 0.712$. In Fig 6 the distribution of H_μ along the cross section of Cu rods extruded by two methods through a die with an entry angle of 22° 30' is shown:- 1 - extrusion by liquid $\phi_{np} = 0.5$; 2 - extrusion by plunger $\phi_{np} = 0.5$. In Fig 7 the distribution of H_μ along the cross section of Cu rods (d - diameter of cross section of liquid-extruded rods, $\phi_{np} = 0.5$ const) extruded through dies with different angles:- 1 - $\alpha = 5°$; 2 - $\alpha = 60°$; 3 - $\alpha = 22° 30'$; 4 - $\alpha = 40°$; 5 - annealed metal. As a result of the above experiments, the authors have arrived at the following conclusions: 1. Cold deformation of metals in liquid-extrusion under

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Change in the Mechanical Properties of Non-Ferrous Metals and Alloys in the Process of Extrusion by a High Pressure Liquid

high pressure increases their strength, whilst preserving their plasticity.
2. The mechanical properties obtained after cold deformation, which are evident in tensile testing, are identical for both extrusion methods.
3. The distribution of deformation along the cross section of a liquid-extruded rod is more uniform than that of a plunger-extruded one.
4. The shape of the instrument influences the distribution of deformation in the liquid-extrusion of metals. It has been found that there are optimum die angles for obtaining a uniform deformation along the cross section of a rod and the best surface properties of the metal.
There are 7 figures, 1 table and 9 Soviet references.

ASSOCIATION: Laboratoriya sverkhvysokikh davleniy AN SSSR (Laboratory for Super-Pressures, Ac.Sc. USSR)

SUBMITTED: February 14, 1958

Card 5/5

SOV/126-7-3-43/44

AUTHORS: Vereshchagin, L. F. and Shapochkin, V. A.

TITLE: Investigation of the Shear Force of Materials at a Hydro-Static Pressure of up to 170 000 kg/cm^2 and above (Issledovaniye sily sdviga materialov pri gidrostaticheskom davlenii do 170 000 kg/cm^2 i vyshe)

PERIODICAL: Fizika metallov i metallovedeniye, Vol 7, Nr 3, p 479 - 1959 (USSR)

ABSTRACT: The experimental equipment and research technique have been described by Vereshchagin (Ref.4). The investigations were carried out with pure substances of D.I. Mendeleyev's periodic system and with special steels. For all investigated substances and steels an increase in resistance to shear, with increase in pressure, is observed (except for polymorphic transformation compounds). Comparative data as to the increase in the resistance to shear with increase in pressure are shown in the table on p 479 (τ_{25}, τ_{50} etc. constant for resistance to shear at pressures of 25, 50 thousand kg/cm^2 etc. respectively).

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SOV/126-7-3-43/44

Investigation of the Shear Force of Materials at a Hydro-Static Pressure of up to 170 000 kg/cm^2 and Above

There is 1 table and 4 references, all Soviet.

ASSOCIATION: Laboratorii fiziki sverkhvysokikh davleniy AN SSSR (Laboratories of the Physics of Super-High Pressures, Ac. Sc., USSR)

SUBMITTED: July 8, 1958

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18.8200

SOV/126-7-3-44/44

AUTHORS: Vereshchagin, L. F. and Shapochkin, V. A.

TITLE: Investigation of the Resistance of Metals to Shear at a Hydrostatic Pressure of up to 300 000 kg/cm^2 (Issledovaniye soprotivleniya sdvigu metallov pri gidrostaticheskom davlenii do 300 000 kg/cm^2)

PERIODICAL: Fizika metallov i metallovedeniye, Vol 7, Nr 3, pp 479-480 (USSR) 1959

ABSTRACT: Complete Translation

As already reported by Vereshchagin (Ref.1), the authors of this paper are carrying out research on the influence of hydrostatic pressure on the change in resistance to shear for various substances. Further improvement of the existing equipment enabled the resistance to shear at pressures of up to 300 000 kg/cm^2 to be studied.

A constant increase in resistence to shear with increase in pressure can be observed for both the investigated materials: technically pure iron and high temperature steel "A" - up to a pressure of 300 000 kg/cm^2. In technically

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SOV/126-7-3-44/44

Investigation of the Resistance of Metals to Shear at a Hydrostatic Pressure of up to 300 000 kg/cm^2

pure iron the increase in resistance to shear is even accelerated with increase in pressure.

Comparative data as to change in resistance to shear with change in pressure are given in the table on p 480. τ_{25}, τ_{100} etc. stand for a pressure of 25, 100 thousand kg/cm^2 etc. respectively.

The absolute values for the resistance to shear at pressures of around 300 000 kg/cm^2 are so high that, for instance, for technically pure iron they become equal to the theoretical strength.

There is 1 table and 2 Soviet references.

ASSOCIATION: Laboratoriya fiziki sverkhvysokikh davleniy AN SSSR (Laboratory of the Physics of Super-High Pressures, Ac. Sc., USSR)

SUBMITTED: July 23, 1958

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28 (5)

SOV/32-25-6-30/53

AUTHORS: Beresnev, B. I., Vereshchagin, L. F., Ryabinin, Yu. N.

TITLE: Method of Investigating the Effect of the Hydrostatic Pressure Upon the Mechanical Properties of Deformed Metals (Metod izucheniya vliyaniya gidrostaticheskogo davleniya na mekhanicheskiye svoystva prodeformirovannykh metallov)

PERIODICAL: Zavodskaya Laboratoriya, 1959, Vol 25, Nr 6, pp 736-737 (USSR)

ABSTRACT: The effect of pressure upon the other mechanical properties of metals which were exposed to an intensive plastic deformation under high pressure is of special interest. For these investigations a method was suggested in the present case which provides a compression of the metal under universal hydrostatic pressure. Compression takes place in a special device (Fig 2) into which the container for the high pressure is fitted (Fig 1). The latter is divided into two vacuums; the sample is inserted in such a manner that it forms sort of conical stopper between the two vacuums. The mode of operation consists in a slow pressure release of the liquid filled into the two vacuums under high pressure in the lower vacuum; thus a difference in pressure between the two

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Method of Investigating the Effect of the Hydrostatic Pressure Upon the Mechanical Properties of Deformed Metals SOV/32-25-6-30/53

vacuums occurs which causes a compression of the sample (as it is between the two vacuums) and a plastic flow takes place in the sample. A hydraulic compressor was used for this purpose (10000 atm) and aluminum AD 1 samples were investigated. With increasing compression pressure also the plasticity of aluminum increases (Fig 3, Diagram) which was found in an extension of the sample under normal pressure following the compression. There are 3 figures and 2 Soviet references.

ASSOCIATION: Laboratoriya fiziki sverkhvysokikh davleniy Akademii nauk SSSR (Laboratory of Physics of Ultra High Pressure of the Academy of Sciences, USSR)

Card 2/2

VERESHCHAGIN, L.F.; SEMERCHAN, A.A.; SEKOYAN, S.S.

Disintegration of a high velocity water jet. Zhur.tekh.fiz. 29 no.1:45-50 Ja '59. (MIRA 12:4)

1. Laboratoriya fiziki sverkhvysokikh davleniy AN SSSR.
(Jets--Fluid dynamics)

PHASE I BOOK EXPLOITATION SOV/4750

Beresnev, B.I., L.F. Vereshchagin, Yu.N. Ryabinin, and L.D. Livshits

Nekotoryye voprosy bol'shikh plasticheskikh deformatsiy metallov pri vysokikh davleniyakh (Some Problems of Large Plastic Deformations of Metals at High Pressures) Moscow, Izd-vo AN SSSR, 1960. 79 p. Errata slip inserted. 3,500 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut fiziki vysokikh davleniy.

Resp. Ed.: S.I. Ratner, Doctor of Technical Sciences; Ed. of Publishing House: K.P. Gurov; Tech. Ed.: L.A. Lebedeva.

PURPOSE: This booklet is intended for technical personnel engaged in the extrusion of metals.

COVERAGE: The booklet presents a summary and analysis of the results of experiments in the investigation of plastic deformation of metals under high pressures. These experiments were conducted during the last few years at the Institut fiziki vysokikh davleniy AN SSSR (Institute of the Physics of

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High Pressures of the Academy of Sciences USSR) as part of a program for studying the physics of solids under high pressures. F.F. Voronov, V.A. Shapochkin, and Ye. V. Zubova collaborated with the authors in carrying out experiments at the instutute. The authors discuss the effect of hydrostatic pressures on the plasticity of metals, the flow of metals in extrusion by high-pressure liquid, the mechanical properties of metals extruded by this method, and the use of this method in the extrusion of fancy shapes and tubing. There are 52 references: 47 Soviet, 4 English, and 1 German.

TABLE OF CONTENTS:

S/120/60/000/01/036/051
E073/E335

AUTHORS: Vereshchagin, L.F. and Domyashkevich, B.P.

TITLE: Making of an Indicator Diagram for High-pressure Compressors

PERIODICAL: Pribory i tekhnika eksperimenta, 1960, Nr 1, pp 118 - 122 (USSR)

ABSTRACT: A four-stage gas compressor built by the Swiss firm "Amsler", a laboratory compressor, a compressor for compressing air to pressures of 270 to 800 katm, described by B.H. Sage and W.H. Lacey (Ref 1) and a compressor for compressing gases up to 5 katm, described by B.A. Korndorf (Ref 2), are mentioned and also a single-stage gas compressor described by one of the authors (Vereshchagin) and Ivanov (Ref 4) for producing pressures up to 5 katm with a compression ratio of 100. Since the real compression cycle is considerably more complex than the theoretical picture, only an indicator diagram based on the pressure directly measured in the compressor will give a good picture of the processes taking place during the compression cycle. The installation consists of an electrically-driven single-stage

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Making of an Indicator Diagram for High-pressure Compressors

gas compressor, equipment for accurate measurement of the position of the rod, high-pressure valves, piping, packing and seals; a photograph of it is shown in Figure 1. In this article, only the main part of the installation is dealt with, namely, the head of the gas compressor and the measuring devices. The compression chamber is designed in the form of a multilayer vessel. A cross-sectional drawing of the head of the gas compressor is reproduced in Figure 2. The precision pair piston/elastic liner are both lapped to a high polish and in the assembled state the radial gap is 0.03 - 0.04 mm; the moving piston is sealed by means of an elastic steel liner of the system described by Vereshchagin and Ivanov (Ref 3). The pressures were measured by means of sensors fitted into a hole drilled into the head of the compressor. Sensors of three types were used, namely, piezo-quartz, induction, electronic sensor of the impeded glow discharge (Ref 4). Cross-sectional drawings of these are reproduced in Figures 3, 4 and 5, respectively.

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Making of an Indicator Diagram for High-pressure Compressors

Particularly, the electronic sensor of impeded glow discharge is very sensitive to small displacements of the mobile electrode and is suitable for more accurate study of the process of compression of gases in the compressor; in Figure 6, an indicator diagram is reproduced which was obtained by means of this sensor. There are 6 figures and 5 references, 4 of which are Soviet and 1 English.

ASSOCIATION: Institut fiziki vysokikh davleniy AN SSSR (Institute of Physics of High Pressures of the Ac.Sc., USSR)

SUBMITTED: November 24, 1958

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S/120/60/000/01/038/051
E192/E382

AUTHORS: Ivanov, V.Ye., Vereshchagin, L.F. and Demyashkevich, B.P.

TITLE: High-pressure Hydraulic Compressor Employing Oil and Water

PERIODICAL: Pribory i tekhnika eksperimenta, 1960, Nr 1, pp 126 - 128 (USSR)

ABSTRACT: The compressor described is illustrated in Figure 1. It is designed for compressing large volumes of liquids to the pressures of 8 to 10 katm. It is a periodically operating machine in that one cycle is completed during each revolution of a crankshaft. The operating cycle is as follows. From a container, the "operating" liquid is admitted through the gland 9 into the annular space between the cylinder 8 and the throttle 7. The liquid has the input pressure of about 30 atm and through three apertures in the throttle is admitted into the annular space formed by the rod 10 and the internal surface of the piston. When the piston is lowered, the liquid is admitted into the channel 6 through the apertures in the rod and results in the lifting of the

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High-pressure Hydraulic Compressor Employing Oil and Water

valve 13 . The compression channel is filled thereby. As soon as the rod passes the lower dead point, the compression cycle is commenced. At the instant when the pressure in the compression chamber is several times higher than that behind the valve 12 the latter is opened and the compressed liquid is expelled. If the compressor operates with water it is necessary to lubricate the piston and the rod. This is done by employing a hypoid grease to the piston 6 and rod 10 and the tightening cylinders 14 . The performance of the compressor is illustrated in Figures 1 and 2. Curve 1 of Figure 2 shows the change of the compressor performance (in litres/min) as a function of the force applied, the input pressure being constant. Figure 3 illustrates the losses due to piston friction as a function of the pressure applied. Curve 1 of Figure 3 represents the hydrostatic pressure, while Curve 2 shows the force received by the rod 10 . The overall dimensions of the compressor (including the mounting frame and the electric motor) are: length 1.5 m; width 0.8 m and height 1.5 m.

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High-pressure Hydraulic Compressor Employing Oil and Water

There are 3 Soviet references and 3 figures.

ASSOCIATION: Institut fiziki vysokikh davleniy AN SSSR (Institute of Physics of High Pressures of the Ac.Sc.,USSR)

SUBMITTED: October 15, 1958

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69093

9.3150

S/120/60/000/01/041/051
E192/E382

AUTHORS: Vereshchagin, L.F. and Fateyeva, N.S.

TITLE: A Method of Producing an Electric Arc at High Pressure

PERIODICAL: Pribory i tekhnika eksperimenta, 1960, Nr 1, pp 133 - 134 (USSR)

ABSTRACT: The equipment used in the investigation of arc discharges at high pressure in nitrogen or argon is shown in the diagram of Figure 1. The device is in the form of a thick-walled cylinder having an external diameter of 90 mm and internal diameter of 22 mm, its overall length being 235 mm. The cylinder is made of steel, type 40Kh, which was annealed to the Rockwell hardness of 40. The device could thus withstand the pressure of 5 000 atm. The middle portion of the cylinder having a length of 74 mm has thicker walls (since it contains an aperture for producing the pressure) and two electrical terminals. One of the electrodes, 24 , is fixed and is insulated from the main body. This is done by inserting a special cone 37 . The conical hole in this cone contains a steel cone 36 which carries a support for the electrode 25 . The tip of the cone 36 contains a steel rod 41 having a

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A Method of Producing an Electric Arc at High Pressure

diameter of 1.7 mm which is insulated from the shutter 38 by the cylinder 42 . At the end of the shutter the cylinder is terminated by the washer 43 . The second electrode 16 is moveable and is not insulated from the body but is grounded through it. The electrode can be displaced axially by 10 mm. The displacement of the electrode is achieved by imparting a movement to the rod 9 . The fixing for the electrode 16 is provided at the "high pressure" end of the rod. The screw 6 serves to move the rod. During the experiment the equipment is water-cooled. The water is circulated in the cooling sleeves 33 . During the investigation of arcs in nitrogen and argon the electrodes were made of carbon in order to obtain stable arcs. The arcs could be obtained with voltages of 80-90 V with currents not higher than 8 A. It was found that at pressures up to 300 atm the arc was generally stable. However, at increased pressures the resistance of the inter-electrode gap was greatly increased and the distance between the electrodes had to be reduced

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A Method of Producing an Electric Arc at High Pressure

and the voltage between them increased in order to maintain the normal glow. The arc in argon is generally more stable than in nitrogen. The authors express their gratitude to G.V. Shcheglakov for his help in producing the equipment and in carrying out the experiments. There is 1 figure.

ASSOCIATION: Laboratoriya fiziki sverkhvysokikh davleniy AN SSSR (Laboratory of Ultrahigh Pressure Physics of the Ac.Sc., USSR)

SUBMITTED: September 29, 1958

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SEMERCHAN, A.A.; VERESHCHAGIN, L.F.; FILLER, F.M.; KUZIN, N.N.

Theory of the destructive action of cavitation. Inzh.-fiz. zhur. no.3:87-90 Mr '60. (MIRA 13:10)

1. Institut fiziki vysokikh davelniy AN SSSR, Moskva.
(Cavitation)

69383

S/136/60/000/04/022/025
E193/E283

18 5100

AUTHORS: Beresnev, B. I., Vereshchagin, L. F., and Ryabinin, Yu. N

TITLE: On Extrusion of Metals With the Aid of Liquid Under High Pressure

PERIODICAL: Tsvetnyye metally, 1960, Nr 4, pp 84-85 (USSR)

ABSTRACT: The results of investigation on plastic flow of metals, subjected to high hydrostatic pressure, have indicated the possibility of modifying the present extrusion process by replacing the rigid ram with a liquid under high pressure. The principle of the classical extrusion process is illustrated in Fig 1a. Fig 1b shows the modified process; in this case the billet (2), placed in the container (1), is forced through the die aperture (3) by liquid supplied from the high-pressure generator. Of course, arrangements can be made for the metal emerging from the die aperture, not straight in the surrounding atmosphere, but into a vessel in which high hydrostatic pressure is maintained; this arrangement is illustrated in Fig 1v. These two variants of the new extrusion method were studied in the Institutes of Physics of High Pressures and Metal Physics of the AS USSR, with the view of establishing the

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On Extrusion of Metals With the Aid of Liquid Under High Pressure

optimum operating conditions. The first problem to be investigated was associated with the fact that not only the magnitude of pressure necessary to force the metal through the die, but also the quality of the extruded metal, are affected by the nature of the liquid employed. The viscosity of some liquids, subjected to high pressure, rapidly increases and a liquid that has been "solidified" in this manner can damage the extruded material; it is for this reason that only liquids whose viscosity is unaffected by high pressure can be used in this application. To lower the extrusion pressure, it is advisable to apply a thin layer of a lubricant on the extrusion billet. (Quite satisfactory results were obtained with water as the high-pressure liquid and hypoid oil as the lubricant). It was established that when high-pressure liquid is used in extrusion, it is necessary to distinguish between the initial and steady (static and dynamic extrusion) conditions. The transition from the former to the latter is accompanied by a sudden and large drop of the pressure required. The energy, stored in the source of high pressure, accelerates the extruded metal

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On Extrusion of Metals With the Aid of Liquid Under High Pressure

so that it leaves the die at rates as high as several hundred m/sec. Consequently, the volume of extruded material can considerably exceed the capacity of the high pressure generator. In the new extrusion method there is no friction between the billet and the container walls and the friction between the metal and the die is considerably reduced; this cannot but reduce the magnitude of pressure necessary to extrude the metal. This has been confirmed experimentally. Thus, for instance, in the case of aluminium, extruded in an ordinary press to

$$\phi = \frac{F - f_o}{F} = 0.9$$

(ϕ - degree of deformation, F - cross-section area of the billet, f_o - cross-section area of the extruded rod), a pressure of 18 000 kg/cm^2 was necessary; a pressure of only 4500 kg/cm^2 was required in the new method. Some of the defects of material extruded by the standard method are associated with friction between the extruded metal and the walls of the container and the die; since

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in the new method, friction is limited to minimum, one should expect more uniform deformation of the extruded metal, and this also has been confirmed by experimental results. It was found, in addition, that the mechanical properties of the material extruded by this method are considerably improved. Thus, for instance, aluminium extruded by the new method to $\psi = 0.9$, had UTS 1.7 higher than in the as-cast condition; This increase in strength was attained without significant reduction of ductility, the reduction of area of the extruded material being 0.62. In the course of the investigation reported in the present article, a press capable of extruding profile shapes by the new method has been constructed. It was concluded that the method described has great practical possibilities. There is 1 figure.

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87374

1.5210

S/120/60/000/004/013/028
E073/E435

AUTHORS: Vereshchagin, L.F., Galaktionov, V.A. and Popov, V.V.

TITLE: On a Tetrahedral Holl Press for Producing Pressures up to 0.1 M atm at Temperatures up to 200°C

PERIODICAL: Pribory i tekhnika eksperimenta, 1960, No.4 pp.106-109

TEXT: The possibility of obtaining very high pressures is of considerable interest from the point of view of producing new materials (synthetic diamonds and borazon) and also from the point of view of geophysical and geochemical investigations. It is anticipated that in the near future, metallurgical investigations will be made at very high pressures and temperatures since the effect of pressure on the displacement of the equilibrium curves of the diagram of state may be considerable. H.T.Hall (Rev. Scient. Instrum., 1958, 29, No.4, 267 - Ref.1) devised an interesting tetrahedral press in which the pressure is transmitted to the specimen by means of a plastic solid body without additionally introducing an element in the liquid phase. The size of the pressure chamber is also larger than that of the design developed by Bridgman. The authors were interested in investigating the possibility of obtaining high pressures by this

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E073/E435

On a Tetrahedral Holl Press for Producing Pressures up to 0.1 Matm at Temperatures up to 200 °C

method and also the obstacles involved in increasing further the pressure and the temperature in equipment of this type. For this purpose, an equipment consisting of four hydraulic presses arranged in the apices of a tetrahedron was designed and tested. The pistons with end pieces, as shown in Fig.1, compress a plastic solid body in the form of a tetrahedron with sides of about 10 mm. The photograph (Fig.1) shows tups (a) which, if suitably arranged, effect the compression of the plastic solid body in the form of a tetrahedron. The same figure shows a tetrahedron from pyrophyllite in various stages of preparation of the container ((b) - initial tetrahedron during fitting of the container, (B) - container substance under investigation which serves simultaneously as the heating element). The container is intended for housing the material to be investigated and also serves as a low resistance electric heating element. The electrical circuit for heating the container consists of tups which are insulated from the body and a container in the form of a metallic tube with covers. Metallic

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On a Tetrahedral Holl Press for Producing Pressures up to 0.1 M atm at Temperatures up to 200°C

strips are welded to the covers which pass from the pyrophyllite tetrahedron along its edges and are in contact with the tups. The high current density for a voltage of a few V is obtained by using two-stage stepdown transformers. The temperature is evaluated from the fusion points of certain metals that are placed into the high-pressure zone. Fig.2 shows a photograph of the apparatus. The force coupling between the hydraulic cylinders can have various forms. In the given case, the cylinders are linked by columns which are in tension when the specimen is in compression. The large diameter of the columns is due to the desirability of reducing the stresses in order to eliminate any changes in the direction of the axes of the cylinders during the process of compression. To ensure initial convergence of the cylinder axes strictly in the centre of the tetrahedron, the length of the columns 1 can be varied by means of regulating nuts 2, located on both sides of the flanges 3, on which the cylinders 4 of the hydraulic presses are fixed. To observe the deviation from the

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On a Tetrahedral Holl Press for Producing Pressures up to 0.1 Matm at Temperatures up to 200°C

correct position of the axes of the cylinder, the tups are substituted during the calibration by rods with sharp tips. The ends of the rods should converge into one point and the angles between the rods should be equal. In spite of the very careful initial adjustment of the cylinders and of the tups there were short-circuits in the heating circuit, indicating that at large pressures (exceeding 50000 atm) the position of the tups differs from the initial one. Strain gauge measurements showed that the tensile stresses in the individual columns may differ very greatly (by a factor of up to 2) and this is attributed to disturbances in the symmetry of the compression of the pyrophyllite tetrahedron. To localize the moments arising in the case of nonsymmetric loading in the press the tups can be prevented from shifting by using pull rods which apparently has been done in the design of Holl. It was established that inside the pyrophyllite tetrahedron the pressure increases linearly with increasing forces in the hydraulic cylinders until such time as the

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On a Tetrahedral Holl Press for Producing Pressures up to 0.1 M atm at Temperatures up to 200°C

thickness of the pyrophyllite film at the side faces of the tups is reduced to hundredths and thousandths of a mm. After that, a further increase in the force of the hydraulic presses does not result in an increase of the pressure of the specimen since the tups transmit the pressure to each other without compressing the pyrophyllite in the centre. The pressure which could be recorded in an equipment of such a type was 70000 to 80000 atm. It was established that the principle of Holl is correct. However, its practical realization leads to numerous difficulties which are analysed in this paper. There are 3 figures and 3 references: 1 Soviet and 2 non-Soviet.

ASSOCIATION: Institut fiziki vysokikh davleniy AN SSSR (Institute of High-Pressure Physics AS USSR)

SUBMITTED: December 15, 1959

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E073/E435

On a Tetrahedral Holl Press for Producing Pressures up to 0.1 Matm at Temperatures up to 200°C

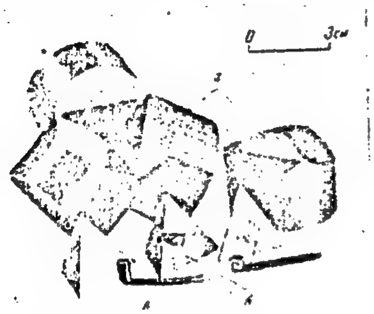

Рис. 1. Наиболее существенные детали установки. *а* — наковальня, *б* — исходный тетраэдр в процессе монтажа контейнера, *в* — контейнер для исследуемого вещества; он же — электронагревательный элемент

Fig.1.

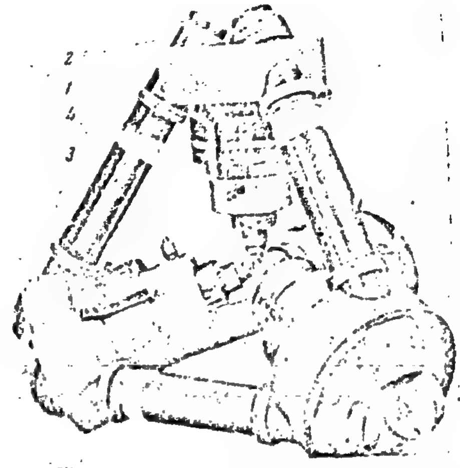

Рис. 2. Общий вид тетраэдрического процесса. *1* — колонны, *2* — регулировочные гайки, *3* — фланцы, *4* — гидравлические прессы

Card 6/6

85350

1.1210

S/120/60/000/005/020/051
E191/E381

AUTHORS: Vereshchagin, L.F., Zubova, Ye.V. and Shapochkin, V.A.

TITLE: Apparatus and Methods for the Measurement of Shear in Solid Bodies at High Pressures

PERIODICAL: Pribory i tekhnika eksperimenta, 1960, No. 5, pp. 89 - 93

TEXT: Referring to a publication by Vereshchagin and Shapochkin (scheduled to appear in Zh.fiz.metallov i metallovedeniye) on measurements of shear stress in pure elements at pressures up to 50 000 atm, in which certain regularities were revealed, improvements in apparatus are described which permitted an extension of the range of measurement to 500 000 atm. A plate of the metal under investigation is placed between the polished faces of two truncated cones pressed against each other. The combination of axial pressure and friction causes the metal plate to flow in a manner which creates a bi-convex lens shape, whilst the initially flat faces of the conical pistons become concave. Two such assemblies are placed in line inside the press and the middle part between the two specimen metal plates is provided with means of being rotated about the axis. This creates a

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E191/E381

Apparatus and Methods for the Measurement of Shear in Solid Bodies at High Pressures

plastic torsional deformation in the specimen. Beyond a certain axial pressure the deformation takes the form of internal slipping inside the specimen. The torque was applied by a rack and pinion mechanism at the rate of 1 degree/sec and measured by a piston-type hydraulic dynamometer. Plates of 3 - 5 mm diameter and various thicknesses between 0.03 and 0.3 mm were used as specimens. Steps were taken to reduce the contact between the specimen and the conical surface of the plungers or else to measure the error caused by such contact. Several tests were carried out with each specimen and if the first of these tests gave singular results, it was ignored. The relation between the torque and angle of rotation was determined for each value of the pressure applied by the press, so that the resistance torque to shear deformation was found to grow with increasing pressure. An example shows the increase of the torque with pressure for 0.45% carbon steel and another example the same relation for molybdenum oxide. The latter

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Apparatus and Methods for the Measurement of Shear in Solid Bodies at High Pressures

illustrates points of chemical transformation by the presence of steps in the curve. The evaluation of the shear stresses from the torque is shown. The presence of hydrostatic support at the point of contact and the mounting of the plungers in tapered holes of large steel rings have made it possible to increase the strength of the plungers made of a stellite-type material by a factor of 10 (details to be published by Shapochkin, V.A. in Inzhenerno-fiz. Zh., 1960).
There are 6 figures and 3 Soviet references.

ASSOCIATION: Institut fiziki vysokikh davleniy AN SSSR (Institute of High-pressure Physics of the AS USSR)

SUBMITTED: August 28, 1959

Card 3/3

85351

1.9600

S/120/60/000/005/021/051
E191/E381

AUTHORS: Vereshchagin, L.F., Semerchan, A.A., Isaykov, V.K. and Ryabinin, Yu.N.

TITLE: Small-size Laboratory Hydraulic Press for 1 000 tons

PERIODICAL: Pribory i tekhnika eksperimenta, 1960, No. 5, pp. 93 - 95

TEXT: A new press is described, designed and made at the Institute of High-pressure Physics of the AS USSR. The distinguishing feature is the use in the pressure cylinder of a pressure up to 5 000 atm as compared with a maximum of 800 atm in industrial presses. The Vereshchagin compressor (Ref. 1) delivering 0.8 litres/hour at 10 000 atm makes this possible (the latest Vereshchagin compressor delivers 80 litres/hour at 6 000 atm). The press has two cylinders of 160 mm bore and 50 mm stroke, and works with glycerin. The cylinders face each other and are backed by bridge plates tied with four columns. The free span between columns is 250 mm. The maximum daylight of the press is 450 mm between the plunger faces when furthest apart. The weight of the press is 6 tons. The cylinder body screws into rings resting against the bridge plates but the

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Small-size Laboratory Hydraulic Press for 1 000 tons

cylinder also fits into the bridge plates in a taper bore. The high-pressure seal of the piston is made up of alternating PVC and fabric reinforced laminated plastic washers. The seal operates on the principle of unbalanced areas which maintains a pressure on the sealing washers in excess of the working pressure. The pressure faces of the pistons are at the end of projections of smaller diameter working in rings screwed into the open end of the cylinder bore. The differential area between the projection and the piston serves to actuate the reverse stroke. Calibration of the press by means of Amsler dynamometer capsules shows that friction losses do not exceed 3%. The deformation of the press components under pressure was measured with dial gauges up to a cylinder pressure of 5000 atm and found to be linear. In operation a constant load could be maintained during several hours without replenishment of the working liquid.

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Small-size Laboratory Hydraulic Press for 1 000 tons

There are 4 figures, 1 table and 1 Soviet reference.

ASSOCIATION: Institut fiziki vysokikh davleniy AN SSSR (Institute of High-pressure Physics of the AS USSR)

SUBMITTED: August 7, 1959

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86750

6,8000 (3201,1099,1162)
1.1210

S/120/60/000/006/026/045
E073/E335

AUTHORS: Voronov, F.F. and Vereshchagin, L.F.

TITLE: High-pressure Apparatus for Ultrasonic Investigations up to 10 katm.

PERIODICAL: Pribory i tekhnika eksperimenta, 1960, No. 6, pp. 104 - 107

TEXT: For the purpose of studying the elastic properties of solid bodies at pressures up to 10 katm. by means of ultrasonic pulses, using a method described in earlier work (Ref. 1), compact high-pressure equipment was built. This equipment can also be used for other investigations for which it is sufficient to have available a volume of 96 cm^3. The range of operating temperatures is determined by the potentialities of the circulation thermostat, which is connected to the jacket of the high-pressure vessel and also by the properties of the operating fluid. A sketch of the equipment is shown in Fig. 1. A high-pressure vessel 1 contains a quartz plate and the investigated specimen.

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High-pressure Apparatus for Ultrasonic Investigations up to 10 katm.

The pressure multiplier consists of two cylinders 17 and 21 with pistons 18 and 20 and the housing 19, 3 being a connection crosspiece. The low-pressure system 10-15 feeds the pressure multiplier. The system 5-9 produces a preliminary pressure of the operating fluid in the high-pressure range which is measured by a 10 katm. spring pressure gauge 16 and a manganin pressure gauge 4. The outer thermostat 2 is connected to the jacket of the high-pressure vessel. The entire equipment is vertical and is mounted in a housing of 1.2 x 1 x 2.2 m, made of 10 mm thick sheet steel. Visual observation of the pressure gauges is through a 120 x 200 mm window, which is protected by a 35 mm thick sheet of perspex. The equipment is controlled by a press-button pump starter and a system of valves, the handles of which are outside the housing. The components of the equipment are described in some detail. Fig. 2 shows the obturator 5

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E073/E335

High-pressure Apparatus for Ultrasonic Investigations up to 10 katm.

with a collar 1 and a seal consisting of two steel rings 2 and 4 and the teflon ring 3 . The obturator fits onto the holder of the specimen 9 . The same figure shows clearly the radiofrequency lead into the high-pressure zone, connecting the quartz plate 10 that is glued onto the specimen 11 with the pulse-generating equipment. The radio connection is made by means of a steel head 8 which carries a thin spike and a plane-parallel sealing ring 7 and a plane-parallel microlite, 3 mm thick, sealing ring. Chlorvinyl washers are fitted between the faces of the microlite ring and the adjacent steel surfaces. The steel spike is a current conductor but also serves for preliminary pressing of the steel head and the microlite ring onto the flat face of the obturator. The self-capacitance of the radio input lead was 22 pF in air at 10 Mc/s. Fig. 3 shows a sketch of the joint of individual elements of the high-pressure system. Fig. 4 shows the internal housing of the high-pressure

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High-pressure Apparatus for Ultrasonic Investigations up to 10 katm.

cylinder of the multiplier : the piston 10 has a seal consisting of a mushroom-shaped part 5 , the seat 9 , steel 8 , copper 6 and teflon 7 sealing rings. This figure also shows the obturator 1 , which is fitted with an uncompensated surface consisting of a stepped bushing 4 and chlorvinyl rings 2 and 3 . Fig. 6 shows an obturator with the electric leads to the manganin pressure gauge. The equipment worked reliably in the pressure range of 10 katm. The "mushroom" seals of the piston of the cylinder withstood 30 operating cycles without requiring replacement. The sealing rings of the obturator in the high-pressure vessel required frequent replacement due to the fact that the obturator has to be removed and re-fitted after each test.

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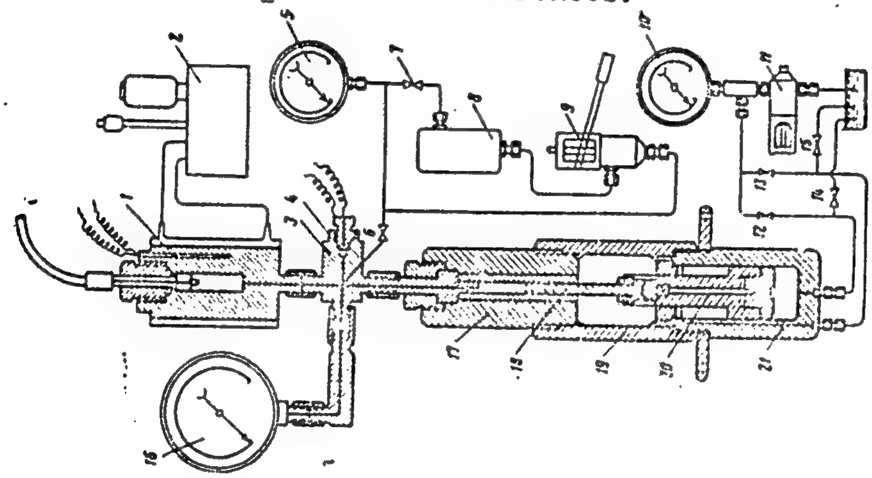
High-pressure Apparatus for Ultrasonic Investigations up to 10 katm.

Acknowledgments are expressed to M.Ya. Knutov for his participation in the assembly and operation of the equipment.
There are 5 figures and 3 Soviet references.



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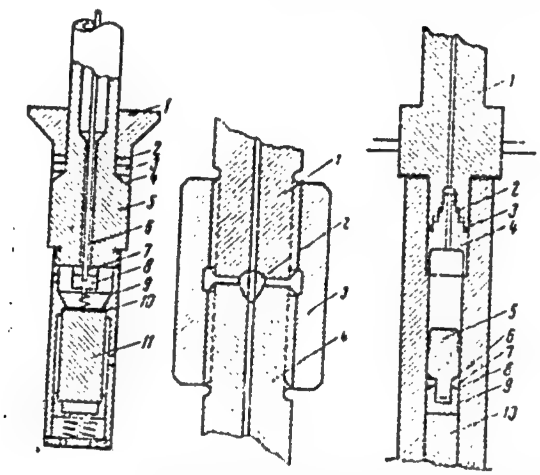
High-pressure Apparatus for Ultrasonic Investigations up to 10 katm.



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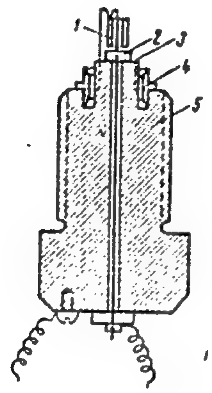
High-pressure Apparatus for Ultrasonic Investigations up to 30 katm.



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High-pressure Apparatus for Ultrasonic Investigations up to 10 katm.

ASSOCIATION: Institut fiziki vysokikh davleniy AN SSSR (Institute of High-Pressure Physics of the AS USSR)

SUBMITTED: November 18, 1959

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S/193/60/000/007/003/012
A005/A001

1.5200

AUTHORS: Vereshchagin, L. F., Semerchan, A. A., Isaykov, V. K., Ryabinin, Yu.N.

TITLE: A Hydraulic Press of 1,000-t Force

PERIODICAL: Byulleten' tekhniko-ekonomicheskoy informatsii, 1960, No. 7, pp. 15-17

TEXT: The Institut fiziki vysokikh davleniy AN SSSR (Institute of Physics of High Pressures of the Academy of Sciences USSR) developed and produced a hydraulic press of 1,000-t force with the operational pressure in the cylinder up to 5,000 kg/cm^2, which is provided for by the hydrocompressor К-6 (K-6) of the L. F. Vereshchagin-system with the delivery of 0.8 l/hr at the pressure of 10,000 kg/cm^2, which was also produced by the Institute. The design of the press is presented in the figure. Two equal thickwalled cylinders 1 and 2 of steel of the brand 45ХНМФА (45KhNMFA) have 160 mm diameter and can operate together as well as separately. Their external surfaces 3 are conical with 5^o summary angle and can be deformed under the operation pressure of the liquid by up to 0.1 mm. These radial forces are transmitted to the traverse 4 abolishing the deformation of the cylinder walls. Nut 5 transmits a partial press force immediately into the cylinder walls for supporting, the rest into the traverse through the nut face. The press piston 6

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87006
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A005/A001

A Hydraulic Press of 1,000-t Force

consists of the piston proper, the piston head 7, the set of vinyl-chloride- and textolite-packing rings, a nut, and a tie bolt. Incompensated areas ensure the pressure in the packings higher than the operation pressure. The reversal of the piston is effected by liquid supply into the cavity 8 sealed by packings in the piston and cylinder. The press traverses are connected by 4 columns.

Technical characteristics of the press:

Operating liquid:	technical glycerin, oil СУ (SU)
Overall-sizes:	
Height	2,000 mm
Width	800 mm
Distance between the columns diametrically	550 mm
Clearance between the columns	250 mm
Weight	6 t

The calibration test of the friction in the cylinder yielded the maximum friction loss of 3%.

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VERESHCHAGIN, L.F.; FEDOROVSKIY, A.Ye.; ISAYKOV, V.K.; SLESAREV, V.N.; SIMERCHAN, A.A.

Possibility of using plastic solid materials as a working medium in cylinders of powerful hydraulic presses. Inzh.-fiz.zhur. no.7: 132-134 Jl '60. (MIRA 13:7)

1. Institut fiziki vysokikh davleniy AN SSSR, g. Moskva.
(Hydraulic presses)

VERESHCHAGIN, L.F.; SHAPOCHKIN, V.A.

Contact strength of the VK8 cermet hard alloy under a pressure of several hundred thousand kg/cm^2. Inzh.-fiz.zhur. no.11:42-47 N '60. (MIRA 13:11)

1. Institut fiziki vysokikh davleniy, Moskva.
(Strains and stresses) (Cermets--Testing)

BERESNEV, B.I.; VERESHCHAGIN, L.F.; RYABININ, Yu.N.

Conditions of outflow and change of mechanical properties of metals subjected to extrusion by a liquid under high pressure. Inzh.-fiz. zhur. no.12:43-48 D '60. (MIRA 14:3)

1. Institut fiziki vysokikh davleniy, g. Moskva, i Institut fiziki metallov AN SSSR, g. Sverdlovsk.
(Extrusion(Metals))

82984

S/181/60/002/008/003/045
B006/B070

24.4100

AUTHORS: Yevdokimova, V. V., Vereshchagin, L. F.

TITLE: The Problem of the Determination of the Distance Between the Atoms of a Substance Under Pressure. I. The Compressibility of Barium and Strontium

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 8, pp. 1701-1707

TEXT: The authors have developed a simple method for the determination of the compressibility of substances by means of X-ray diffraction. The method is applicable up to pressures of 15,000 kg/cm^2. In the introduction the authors discuss the flaws of the usual methods and the extensive corrections required for them. They suggest the measurement of the compressibility of a substance by an X-ray determination of the change in volume according to the change in the lattice parameters, since such a method is free from the disadvantages mentioned above. An analogous method has been applied since 1933 (Cohn, Jacobs, and others), but the investigations extended only up to 10,000 kg/cm^2 pressure.

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82984

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B006/B070

The Problem of the Determination of the Distance Between the Atoms of a Substance Under Pressure. I. The Compressibility of Barium and Strontium

In the present work the authors investigated strontium and barium in a high pressure X-ray chamber (described in Ref. 9) with manganine manometer and multiplier (Fig. 1). Strontium and barium are chosen because they are highly compressible and therefore the diffraction lines show a considerable shift under pressure. The pressure is transmitted through benzine to the samples enclosed in a beryllium vessel, and the change in the resistance is measured with a manganine manometer. The strontium showed a series of impurities (3% FeO, 2% CrO, 0.03% CuO), so also did barium (0.01% Fe, and traces of Zn, Cr, Pb, Cu, Cd). A photograph taken with strontium is shown in Fig. 2; the upper spectrum was taken without pressure, and the lower one under a pressure of 11,400 kg/cm^2. A clear displacement of the lines is to be seen. Fig. 3 shows the interplanar spacings for strontium (lower curve) and barium (upper curve) as functions of the pressure. For barium measurement a special construction of the X-ray chamber was used; it is shown diagrammatically in Fig. 4. The beryllium vessel here was a cone-shaped

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82984

The Problem of the Determination of the Distance Between the Atoms of a Substance Under Pressure. I. The Compressibility of Barium and Strontium

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flask. Fig. 5 shows a photograph of this chamber with two hand presses. The X-ray photographs with (10,000 kg/cm^2) and without pressure for barium are shown in Fig. 6. Figs. 7 and 8 show the compressibility of strontium and barium respectively as function of pressure. The upper lines in both are taken directly from a paper by Bridgman. The diagrams show that for both substances $\frac{1}{V}\frac{dV}{dP}$ decreases linearly with P; the decrease is somewhat quicker for barium than for strontium. In the equation $-\frac{\Delta V}{V_o} = aP + bP^2$, the following numerical values are found for the coefficients. For strontium, $a = 81.0 \cdot 10^{-7} \pm 1.4$, $b = -101.1 \cdot 10^{-12} \pm 3.4$; for barium, $a = 100 \cdot 10^{-7} \pm 4.4$, $b = -155.5 \cdot 10^{-12} \pm 9.0$. Finally the authors thank V. G. Gorshkov and V. D. Frolkin, mechanics, and L. A. Maksimova, laboratory assistant, for help in the experiments. There are 8 figures and 9 references: 2 Soviet and 7 US.

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82984

The Problem of the Determination of the Distance Between the Atoms of a Substance Under Pressure. I. The Compressibility of Barium and Strontium

S/181/60/002/008/003/045
B006/B070

ASSOCIATION: Institut fiziki vysokikh davleniy AN SSSR Moskva (Institute for Physics of High Pressures of the AS USSR, Moscow)

SUBMITTED: December 16, 1959

X

Card 4/4

86433

also 2108

S/181/60/002/011/017/042
B006/B056

24.2130

AUTHORS: Vereshchagin, L. F. and Zubova, Ye. V.

TITLE: Measurement of the Resistivity of Iodine and Black Phosphorus Under Pressures of up to 200,000 atm

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 11, pp. 2776-2777

TEXT: The resistivity of iodine and red phosphorus at pressures of 1 - 200,000 atm was measured at room temperature. These ultrahigh pressures were measured with a device designed at the Institut fiziki vysokikh davleniy AN SSSR (Institute of the Physics of High Pressures of the AS USSR) and a compensation method. The pressure dependence of resistivity was measured in both directions. Fig. 1 shows that the resistivity of iodine decreases quickly with growing pressure, and approaches that of metal at a pressure of about 70,000 atm. After pressure is removed, resistivity increases until it reaches almost its initial value; the resistivity of iodine changes by 10^5 times. It may thus be assumed that at such high pressures a semiconductor goes over into a metal. Analogous phenomena are found in black phosphorus. At a pressure of about 43,000 atm, red phosphorus irreversibly goes over into black phosphorus, which is accompanied by

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Measurement of the Resistivity of Iodine and Black Phosphorus Under Pressures of up to 200,000 atm

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B006/B056

a resistivity jump. The resistivity of the latter further decreases with growing pressure until at pressures of ~110,000 atm the metallic state is reached. If pressure is again allowed to drop, resistivity increases and reaches almost its initial value; black phosphorus, however, remains a metal. It may therefore be said that at pressures of 150,000 - 200,000 atm iodine and black phosphorus are good conductors. There are 2 figures.

ASSOCIATION: Institut fiziki vysokikh davleniy AN SSSR Moskva (Institute of the Physics of High Pressures of the AS USSR, Moscow)

SUBMITTED: June 16, 1960

Card 2/2

S/170/60/003/03/14/034
B014/B007

10.4000

AUTHORS: Semerchan, A. A., Vereshchagin, L. F., Filler, F. M., Kuzin, N. N.

TITLE: The Problem of the Destructive Effect of Cavitation

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, 1960, Vol. 3, No. 3, pp. 87-90

TEXT: The formation of cavities by quickly moved liquids is investigated. Among other things, the authors refer to the opinion expressed by M. Kornfel'd (Ref. 3), according to which the destructive effect is caused immediately by the water hitting the metal surface. Besides this purely mechanical theory of the effect produced by cavitation, also the chemical theory is mentioned. Experimental results, in which the time-dependence of the formation of cavities on various factors was investigated, are discussed. As may be seen from Fig. 2, the time for the formation of cavities decreases sharply with increasing velocity. Fig. 3 graphically shows the dependence of the time required for the formation of cavities upon the distance between the metal plate and the nozzle for three different nozzle diameters

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The Problem of the Destructive Effect of Cavitation

S/170/60/003/03/14/034
B014/B007

(0.64-0.84 mm). The rate of outflow was 440 m/sec. For each of the three curves it was found that at a certain distance the time required for the formation of cavities is a minimum. This high intensity of cavitation is connected with the division of the jet. The results obtained tend to confirm the mechanical cavitation theory. There are 3 figures, 3 tables, and 6 references: 4 Soviet and 2 English.

ASSOCIATION: Institut fiziki vysokikh davleniy AN SSSR, g. Moskva (Institute of High-pressure Physics of the AS USSR, City of Moscow)

Card 2/2

S/170/60/003/07/11/011
B012/B054 82234

5.1600

AUTHORS: Vereshchagin, L. F., Fedorovskiy, A. Ya., Isaykov, V. K., Slesarev, V. N., Semerchan, A. A.

TITLE: The Possibility of Using Plastic Solids as Working Medium in Cylinders of Large-sized Hydraulic Presses

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, 1960, Vol. 3, No. 7, pp. 132 - 134

TEXT: For scientific research work, it is necessary to produce pressures of 100,000 atmospheres excess pressure and more in large volumes. Large-sized presses are used for this purpose. At the Institut fiziki vysokikh davleniy AN SSSR (Institute of High-pressure Physics of the AS USSR) it was possible to increase the working pressure of the liquid in the press cylinder up to 5,000 atmospheres excess pressure (Ref. 1). Since a further increase in pressure involves great difficulties with respect to packings, a 1,000-t pressure transformer model was designed at the same institute. A plastic solid is used instead of a liquid. Fig. 1 shows the principal scheme of this pressure transformer. First,

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The Possibility of Using Plastic Solids as Working Medium in Cylinders of Large-sized Hydraulic Presses

S/170/60/003/07/11/011
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preliminary experiments are made on a 200-t model. Silver chloride, Teflon, and lead were used in these experiments; it appeared that lead yielded maximum efficiency. In the experiments on the 1,000-t pressure transformer, liquid lead was poured into the working room. The performance of the experiments is described in brief. Fig. 2 shows the experimental curves for the dependence of force P_2 on force P_1. The efficiency with pressures over 10,000 atmospheres excess pressure is about 90%. The method described permits an increase in working pressure up to the elastic limit of the construction material used. There are 2 figures and 1 Soviet reference.

ASSOCIATION: Institut fiziki vysokikh davleniy AN SSSR, g. Moskva (Institute of High-pressure Physics of the AS USSR, Moscow)

Card 2/2

APPROVED FOR RELEASE: 09/01/2001 CIA-RDP86-00513R001859430002-9"

85432

S/170/60/003/011/003/016
B019/B056

18.6100 also 2108

AUTHORS: Vereshchagin, L. F., Shapochkin, V. A.

TITLE: The Problem of the Contact Stability of a Cermet of the Type BK8 (VK8) at Pressures of Several Hundreds of Thousands of kg/cm^2

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, 1960, Vol. 3, No. 11, pp. 42-47

TEXT: For the experiments described here, the specimens were produced partly at the Institut tverdykh splavov (Institute of Hard Alloys) and partly at the Institute mentioned under Association. These specimens had the shape of frustums, and by honing the surfaces were improved. The shear stress under high pressure (500,000 kg/cm^2) was measured. From the radial and circular cracks the authors draw conclusions as to the quality of the material. The destruction of the contact surfaces was photographically recorded, viz. by pictures taken before the experiment, at the beginning of the forming of cracks, and after the experiment. Likewise, hardness measurements and microphotographs were made. During pressing,

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The Problem of the Contact Stability of Cermet of the Type BK8 (VK8) at Pressures of Several Hundreds of Thousands of kg/cm^2

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B019/B056

radial cracks developed, which then spread onto the conical part of the frustums At high pressures (200 - 300 000 kg/cm^2) the local destruction of the specimen was not accompanied by a general splitting up of the specimen . At lower pressures (50 100,000 kg/cm^2) a general splitting up occurred. In the first case, the contact surface had a diameter of 2-3 mm in the second case one of 5-10 mm. Rotation of the specimen accelerates the process of destruction and diminishes the load necessary for destruction. The Rockwell hardness increases in the contact zone by 10-20%, the microhardness according to Vikers increased by 50-70%. A theoretical investigation is intended to follow in a second part of this paper. S. A. Tsukerman is mentioned. There are 3 figures and 8 Soviet references.

ASSOCIATION: Institut fiziki vysokikh davleniy, g. Moskva (Institute of the Physics of High Pressures, Moscow)

SUBMITTED: November 23, 1959

Card 2/2

88007

S/170/60/003/012/004/015
B019/B056

11200

AUTHORS: Beresnev, B. I., Vereshchagin, L. F., Ryabinin, Yu. N.

TITLE: Conditions of Flow and Change in the Mechanical Properties of Metals During Their Extrusion by High Pressure Liquid

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, 1960, Vol. 3, No. 12, pp. 43-48

TEXT: Experiments are reported of carrying out metal extrusion directly by means of a high-pressure liquid, without using intermediate elements. The authors built a test device, by means of which experiments under pressures of up to 10,000 atm were carried out. The selection of the liquid plays an important part, and in Table 1 results obtained by previous experiments on commercial-grade aluminum of the type АД1(AD1) (99.3% Al, 0.7% Fe+Si+Cu) are given. The extrusion pressures of a number of metals are given in Table 2. From experiments concerning the most favorable conditions obtainable it followed that the most favorable inlet angle for all metals investigated here is about 15° (45° in extrusion with conventional methods), which is much more favorable for conditions of

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88007

Conditions of Flow and Change in the Mechanical Properties of Metals During Their Extrusion by High Pressure Liquid

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friction. Further, a considerable decrease of extrusion pressure from 18,000 kg/cm^2 to 4,500 kg/cm^2 was observed, as well as an improvement of the tensile strength of from 10.9 to 18 kg/mm^2, and a considerably more uniform distribution of microhardness over the cross section of the material extruded by this method. The surface quality is also better than in the case of a conventional method. There are 4 figures, 2 tables, and 5 references: 4 Soviet and 1 German.

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ASSOCIATION: Institut fiziki vysokikh davleniy, g. Moskva (Institute of the Physics of High Pressures, Moscow). Institut fiziki metallov AN SSSR, g. Sverdlovsk (Institute of the Physics of Metals, AS USSR, Sverdlovsk)

SUBMITTED: January 30, 1960

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B019/B056

TABLE 1

Liquids	Initial pressure of flow, atm	Surface quality
Hypoid oil	3570	Poor
Transformer oil	5500	Satisfactory
50% Transformer oil + 50% kerosene	6500	Satisfactory
49% Transformer oil + 49% kerosene + 2% oleic acid	6450	Satisfactory

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Kerosene	6900	Satisfactory
Gasoline	6900	Satisfactory
Methyl alcohol	6075	Satisfactory
Ethyl alcohol	6450	Satisfactory
Water	5500	Good
Water + test piece coated with hypoid oil	5000	Excellent

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B019/B056

TABLE 2

Alloy	АД1	М2	АМГ	Д1М	Л-62	АК6	Be	Ст 15
Composition	99.3%Al	99.7%Cu	97%Al +Mn+Mg	Dur-alumin	Brass	94%Al+ Cu+Mn+Si		Steel, 0.15%C
Degree of reduction, %	95.0	81.2	87.0	81.2	53.5	38.0	17.2	30
Extrusion pressure, kg/cm2	6000	8600	9900	9000	9600	2000	6800	7300

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68628

18.8200

S/126/60/009/02/016/033
E073/E335

AUTHORS: Vereshchagin, L.F. and Shapochkin, V.A.

TITLE: Effect of Hydrostatic Pressure on the Shear Resistance of Solid Bodies

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 2, pp 258 - 264 (USSR)

ABSTRACT: In earlier work (Refs 11, 12) the authors have described results obtained with hydrostatic pressures up to 300 kg/cm^2. In this paper results are described of the effects of hydrostatic pressures up to 500 000 kg/cm^2 on the shear resistance in solid bodies. A modification of the Bridgman apparatus, described in an earlier paper (Ref 7) was used. More than 20 elements and 10 steels and alloys were studied; data on the mechanical properties of these are entered in Table 1, p 260. The obtained results are given in Tables 2 and 3 and plotted in graphs, Figures 1 and 2. Most of the substances were tested at pressures of 100 000 to 150 000 kg/cm^2; iron and tungsten - at pressures up to 300 000 kg/cm^2;

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E073/E335

Effect of Hydrostatic Pressure on the Shear Resistance of Solid Bodies

St45 and nickel, stainless and heat-resistant 2Kh18N9 alloys - at pressures up to 500 000 kg/cm^2. Analysis of the results indicates that the shear resistance increases almost linearly with increasing pressure up to 500 000 kg/cm^2; in the first approximation, this is in agreement with previous experimental data and theoretical calculations carried out by B. Deryagin (Ref 8) about twenty-five years ago. The calculated coefficients A_1 and B_1:

$$\tau = A_1 + B_1 \cdot p \quad (4)$$

do not differ greatly from those calculated by I.V. Kragel'skiy (Ref 10) on the basis of the experimental results of Bridgman (Ref 9). Those for Sb, Bi, Te and other elements - local breaks were observed in the straight lines at sections which are near to the points of polymorphic transformation, Figure 3. For very high pressures,

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Effect of Hydrostatic Pressure on the Shear Resistance of Solid Bodies

of the order of hundreds of thousands of kg/cm^2, the dependence of the shear resistance on the pressure is more pronounced still. For several substances, the shear resistance at pressures of several hundred thousand kg/cm^2 was of the same order as the pressure. The absolute values are equal or even higher than the theoretical strength of these substances at atmospheric pressure. Thus, for armco iron the shear resistance at 300 000 kg/cm^2 was about 750 kg/mm^2 and for the steel 45 it was about 1 300 kg/mm^2 (1 500 kg/mm^2 according to Figure 2). The relatively small number of investigated substances does not permit deriving a quantitative dependence of the periodic change of the shear resistance at such high pressures on the atomic number of the element. but a qualitative conclusion on the correctness of the periodic law and on the gradual attenuation of the periodicity with increasing pressure can be made on the

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E073/E335

Effect of Hydrostatic Pressure on the Shear Resistance of Solid Bodies

basis of the results now available. Acknowledgments are expressed to Mechanic S.T. Vlasov for his assistance in carrying out the experiments.
There are 3 figures, 3 tables and 12 references, 3 of which are English and 9 Soviet.

ASSOCIATION: Institut fiziki vysokikh davleniy AN SSSR (Institute of High-pressure Physics of the Ac.Sc., USSR)

SUBMITTED: January 21, 1959

Card 4/4

Vereshchagin, L. F.

81909

S/126/60/010/01/015/019
E073/E535

18.8200

AUTHORS: Vereshchagin, L.F., Shapochkin, V. A. and Zubova, Ye.V.

TITLE: On the Question of Friction and Shear at High Contact Pressures

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol.10, No.1, pp.135-139

TEXT: Bridgman (Ref.2) and the authors of this paper (Refs.3 and 4) used pressures of up to 5 000 kg/cm^2 in their experiments in order to study the changes in the friction forces and internal shear (sliding) at very high pressures and to study the phenomenon of "freezing" (seizing) of contact surfaces. The principle of the operation of the test machine used by the authors of this paper for bringing about shear under the effect of pressure was described in an earlier paper (Ref.5). A sketch of the test-rig for applying normal pressure and a torque is shown in Fig.1. A thin plate of the investigated material is placed between two carbide pistons and pressed down and, following that, the pistons are turned relative to each other. The rotation was proceeded with until the torque stopped increasing. Thereby,

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On the Question of Friction and Shear at High Contact Pressures

the speed of turning was constant and so small that the thermal effects could be disregarded. The dependence of the turning angle on the torque for various specific pressures in the normal direction were determined. Under the effect of the applied normal pressure the plate assumed the shape of a double concave lens, whilst the surfaces of the pistons remained convex. The results are plotted in Figs.2, 3 and 4 and entered in a Table, p.138. The increase in internal sliding with increasing pressure was measured up to pressures of 500 000 kg/cm^2, whilst the increase in the friction force and the change in the friction coefficient (in absence of seizing) was measured for pressures up to 100 000 kg/cm^2 for the following rubbing pairs: the carbides VK8 against VK8, the steel ShKhl5 against the steel ShKhl5, the carbide VK8 against the steel ShKhl5 (Fig.4, Table, p.138). Furthermore, the "freezing" phenomenon was investigated which is caused by transition from external friction to internal slips. For most of the chemical elements, steels and commercial alloys the critical pressure range at which the transition from external friction to

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E073/E535

On the Question of Friction and Shear at High Contact Pressures

internal slipping takes place varies between 15 and 50 000 kg/cm^2 and depends on the nature of the investigated material, namely, its crystal structures. There are 4 figures, 1 table and 5 Soviet references.

ASSOCIATION: Institut fiziki vysokikh davleniy AN SSSR (Institute of High Pressure Physics, AS, USSR)

SUBMITTED: January 3, 1960

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Card 3/3

85971

S/126/60/010/005/024/030
E193/E483

1.1210

AUTHORS: Vereshchagin, L.F., Shapochkin, V.A, and Pirogova, L.B,

TITLE: On the Residual Strength (Resultant) From Shear Under High (Hydrostatic) Pressure

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol.10, No.5, pp.783-785

TEXT: Although strength and plasticity of metals, subjected to ultra-high (> 100000 atm) hydrostatic pressure, are considerably higher than those displayed under normal conditions, the permanent (residual) gain in strength and plasticity due to the action of hydrostatic pressure is small, except in cases when the application of high pressure brings about phase transformations or other similar changes which may profoundly affect the mechanical properties of metals. The present authors studied the effect of high hydrostatic pressure on the properties of commercial grade iron and steels ЭИ437А (EI437A) and 45. Experimental specimens, in the form of thin (less than 0.1 mm thick) round discs, were subjected either to the action of hydrostatic pressure (100000 to 300000 atm) alone, or were sheared in torsion while under pressure. For the shear tests, the specimens were placed between flat faces of two

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E193/E483

On the Residual Strength (Resultant) From Shear Under High (Hydrostatic) Pressure

rods, made of the carbide BK(VK), through which the torque of up to 1000 kg cm was applied, the maximum deformation attained being 55°. The residual effects of both treatments were studied by hardness and micro-hardness measurements and by metallographic examination. The results obtained confirmed that no permanent increase in strength of a metal is attained by the application of high hydrostatic pressure alone. However, in the case of specimens subjected to the simultaneous action of pressure and shear, increase in hardness, reaching 150% in the most heavily deformed regions, was observed. Acknowledgments are expressed to laboratory assistant Z.A.Levchenko for helping with the measurements. There are 3 figures, 1 table and 3 Soviet references (one of which is a translation from English).

ASSOCIATION: Institut fiziki vysokikh davleniy AN SSSR (Institute of High Pressure Physics AS USSR)

SUBMITTED: May 20, 1960

Card 2/2

5.4700
5.1600

68984

S/020/60/131/02/023/071
B013/B011

AUTHORS: Kabalkina, S.S., Vereshchagin, L.F.

TITLE: X-Ray Study of the Linear Compressibility of Graphite at Pressures of up to 16,000 kg/cm^2

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol 131, Nr 2, pp 300-302 (USSR)

ABSTRACT: The present paper describes the direct determination of the compressibility $k_{\parallel} = \frac{1}{c}\frac{\partial c}{\partial P}$ (in parallel with the hexagonal axis) of artificial, spectroscopically pure graphite and of Ceylon graphite at high pressures (up to 16,000 kg/cm^2) by using the method of X-ray diffraction. The artificial graphite was studied in a high-pressure X-ray chamber (Fig 1). This chamber can be conveniently used for pressures of up to 14,000 to 16,000 kg/cm^2 which can be maintained for several days. By means of the box used in the chamber four pictures may be obtained per film. Figure 3 shows four film pictures of graphite at different pressures. These X-ray pictures contain the lines 0002_{α} and 0002_{β} which were used to determine c at various pressures P. In order to check the data obtained, also artificial graphite was investigated in the same pressure range, but in another type of high-pressure X-ray chamber. In this chamber Nr 2 Ceylon graphite was also investigated, at pressures of up to 10,000 kg/cm^2. Table 1 gives the $\Delta c/c$ values of artificial and Ceylon

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X-Ray Study of the Linear Compressibility of Graphite at Pressures of up to 16,000 kg/cm^2 S/020/60/131/02/023/071 B013/B011

graphite for various pressures. In good approximation $\frac{\Delta c}{c} = a.10^{-7}P - b.10^{-12}P^2$ holds. The coefficients a = 28 and b = 45 were determined by the method of least squares. According to the data found, Ceylon- and artificial graphite have the same compressibility. The volume compressibility k of graphite is essentially determined by the compressibility $k_{\parallel}$ which is a consequence of the weak van der Waals interactions between the layers. The van der Waals radius of the carbon atom at high pressure can be estimated from the data of this paper. $R_C = 1.63$ Å holds when P = 15,000 kg/cm^2 and $R_C = 1.68$ Å when P = 1 kg/cm^2 (cf. Table 3). Thus, R_C decreases under the effect of high pressure much less than the respective van der Waals radius R_H of the hydrogen atom. There are 4 figures, 3 tables, and 5 references, 1 of which is Soviet.

ASSOCIATION: Institut fiziki vysokikh davleniy Akademii nauk SSSR (Institute of High Pressure Physics of the Academy of Sciences of the USSR)

PRESENTED: November 4, 1959, by G.V. Kurdyumov, Academician

Card 2/2

S/020/60/132/05/24/069
B014/B125

AUTHORS: Vereshchagin, L. F., Galaktionov, V. A., Semerchan, A. A., Slesarev, V. N.

TITLE: A High-pressure and High-temperature Apparatus With Conic Dies

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 132, No. 5, pp. 1059 - 1061

TEXT: The diagram of the apparatus described here is shown in Fig. 1. The two conically pointed dies produce the high pressure in the cylindrical working area of a matrix. The matrix is pressed into protective rings to prevent its deformation. Fig. 2 gives a total view; Fig. 3 shows the matrix with the dies. The working area has a final diameter of 11 mm and a height of 25 mm. The dependence of the temperature in the middle of the working area on the output of the heater is graphically represented in Fig. 4. Studies at pressures of 60-70,000 kg/cm^2 are being carried out on the apparatus at present, at which tempera-

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A High-pressure and High-temperature Apparatus With Conic Dies

S/020/60/132/05/24/069
B014/B125

tures up to 2000°C are reached. By means of this apparatus it could be determined that Armco iron which was melted at a pressure of 70,000 atm and exposed at 2000°C was unusually hard after slow cooling. This effect must be more closely investigated. There are 4 figures and 3 references: 1 Soviet and 2 American.

ASSOCIATION: Institut fiziki vysokikh davleniy Akademii nauk SSSR (Institute for High Pressure Physics of the Academy of Sciences of the USSR)

PRESENTED: March 11, 1960, by G. V. Kurdyumov, Academician

SUBMITTED: March 1, 1960

VC

Card 2/2

APPROVED FOR RELEASE: 09/01/2001 CIA-RDP86-00513R001859430002-9"

KABALKINA, S.S.; VERESHCHAGIN, L.F.

X-ray examination of the linear compressibility of boron nitride at pressures up to 16,000 kg./cm^2. Dokl.AN SSSR 134 no.2: 330-332 S '60. (MIRA 13:9)

1. Institut fiziki vysokikh davleniy Akademii nauk SSSR.
2. Chlen-korrespondent AN SSSr (for Vereshchagin).
(Boron nitride--Spectra)

84681

1 1210 only 2108

S/020/60/134/004/004/023
B019/B067

AUTHORS: Vereshchagin, L. F., Corresponding Member of the AS USSR, and Zubova, Ye. V.

TITLE: The Measuring of the Shearing Stress in a Series of Substances at Pressures of up to 100,000 Atm

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 134, No. 4, pp. 787 - 788

TEXT: To determine the applicability of graphite, silver chloride, and of a number of substances as lubricants for high-pressure plants their behavior on plastic deformation must be known. Shearing stress was measured in a number of materials at pressures of up to 100,000 atm, with the two substances mentioned above, even up to 500,000 atm. The testing apparatus was constructed at the institute mentioned under Association. The substances investigated (0.1 mm thick disks or powder) were pressed between two pistons. One piston could be rotated around its longitudinal axis, the pressure was produced hydraulically. The force which was necessary to rotate the piston was measured by a dynamometer with

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The Measuring of the Shearing Stress in a Series of Substances at Pressures of up to 100,000 Atm

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B019/B067

automatic recording. Fig. 1 graphically shows the shearing stresses of AgCl, Mg, Armco iron, graphite, Katlenite, and pyrophyllite as a function of pressure. The corresponding values of measurement are summarized in Table 1. Up to 100,000 atm the shearing stress increases from 450 kg/mm^2 (Ag) and 2,700 kg/mm^2 (graphite) at 25,000 atm to 1,800 kg/mm^2 (Ag) and 11,600 kg/mm^2 (pyrophyllite) at 100,000 atm. It was demonstrated that above 100,000 atm (8,200 kg/mm^2) the shearing stress of graphite rapidly rises to 135,000 kg/mm^2 at 500,000 atm. The shearing stress of AgCl increases almost linearly to 14,000 kg/mm^2 at 500,000 atm. Hence, the following may be concluded: In the substances studied the shearing stresses increase linearly with pressure in the pressure range of up to 100,000 atm. Pyrophyllite has the maximum shearing stresses, silver chloride the least. The strong increase in shearing stresses for graphite above 100,000 atm indicates a change in the forces of interaction in the interior of the crystal lattice. S. S. Kabalkina (Ref. 3) is mentioned.

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84681

The Measuring of the Shearing Stress in a Series of Substances at Pressures of up to 100,000 Atm

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B019/B067

There are 2 figures, 1 table, and 3 Soviet references.

ASSOCIATION: Institut fiziki vysokikh davleniy Akademii nauk SSSR (Institute of High-pressure Physics of the Academy of Sciences USSR)

SUBMITTED: June 20, 1960

Card 3/3

84659

1.1210 only 2108
5.1600 only 1273,1043

S/020/60/135/001/011/030
B006/B056

AUTHORS: Vereshchagin, L. F., Corresponding Member of the AS USSR, Ryabinin, Yu. N., Preobrazhenskiy, A. Ya., and Stepanov, V. A.

TITLE: Growth of Metal Monocrystals 21 Under High Hydrostatic Pressure 21

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 1, pp. 45-47

TEXT: The growth of metal monocrystals at high pressures is of interest above all because, on the basis of thermodynamic considerations, it must be assumed that the higher the pressure, the lower will be the inclination for forming structural defects. The assumption based on theory that with pressure the regularity of the lattice increases, requires experimental verification, which was the aim of the authors of the present paper. In this, the authors directed their attention also upon the fact that by the action of pressure, the properties of the crystals may undergo an essential change. Al and Zn monocrystals were grown from a melt. The melt

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Growth of Metal Monocrystals Under High Hydrostatic Pressure

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was in a conical graphite container, which was especially well suited, because in it (in the furnace) a temperature gradient of 7 - 10 deg/mm could be well produced. Cooling of the melt was effected by lowering the electric power applied to the furnace. This was arranged in such a manner that the front of the crystallization temperature moved with 0.5 - 0.7 mm/min (at 10,000 atm), by which the rate of crystal growth was determined. First, monocrystals were grown in a vacuum and nitrogen- and argon media (normal pressure), the method being studied and the operation of the furnace watched. These crystals were produced at 0.3 kw (Zn) and 0.8 kw (Al) respectively during a time of 100 and 150 min, respectively. It was found that the electric power used had to be increased approximately linearly with pressure and amounts to 10,000 atm (N_2 or Ar) 1.8 and 3.0 kw, respectively. Under these conditions, the time of growth of a Zn monocrystal is 280 min, and for Al monocrystal 480 min. The experiments were carried out under constant and also not variable pressure. The authors assume that the crystals grown under variable pressure contain less gas than those grown under constant pressure. Growing under constant pressure required a special compensation of the temperature-dependent pressure change; the deviations from the constant pressure value were about ±50 atm.

X

Card 2/3